

REMARKS

As a preliminary matter, Applicant's representative would like to thank Examiner McMahon for courtesies extended in the productive personal interview conducted on December 2, 2004. An Examiner's Interview Summary Record (PTOL-413) was provided by the Examiner at the interview.

In the interview, the Examiner agreed that the proposed claim amendments should overcome the rejection under 35 U.S.C. § 112, second paragraph. The Examiner also agreed that independent claims 1, 2, 6, and 7 should be allowable over the Funai reference. The Examiner also indicated that the prior art search will be updated. However, the Examiner stated that, unless more relevant prior art is uncovered in the updated search, the present application should be in condition for allowance.

Applicants submit a Statement of Substance of Interview below to comply with the requirements of M.P.E.P. § 713.04.

Claims 1-30 are all the claims presently pending in the application.

Applicants gratefully acknowledge that claim 3 would be allowable if rewritten in independent form. However, for the reasons set forth below and as agreed to in the interview, Applicants respectfully submit that all of the claims (i.e., claims 1-20) are allowable.

New claims 8-30 are added to provide more varied protection for the present invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants

specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-7 stand rejected under 35 U.S.C. § 112, second paragraph.

With respect to the prior art rejections, claims 1, 2, 4, 6, and 7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Funai et al. (U.S. Patent No. 6,029,638; hereinafter “Funai”). Claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over Funai.

These rejections are respectfully traversed in the following discussion.

I. STATEMENT OF SUBSTANCE OF INTERVIEW

In the interview, the following was discussed:

A. Identification of claims discussed:

Independent claims 1, 2, 6, and 7, allowable claim 3, and proposed new claims 8-30.

B. Identification of prior art discussed:

Funai.

C. Identification of principal proposed amendments:

As agreed in the personal interview, claims 1-3 and 5-7 are amended to make editorial changes in conformance with U.S. Patent practice and to define more clearly the features of the present application.

D. Brief Identification of principal arguments:

In the interview, Applicants' representative clarified the claimed invention and the device disclosed by Funai. Applicants' representative also explained the clear structural differences between the claimed invention and the Funai reference and the advantages derived from the novel and unobvious structure of the blowby gas circulation system defined by the claimed invention.

Particularly, Applicants' representative pointed out that, in the claimed invention, the oil tank first receives the gas-liquid mixture generated in the crankcase and separates the gas-liquid mixture into a processed gas-liquid mixture and engine oil. Then, the breather chamber receives the processed gas-liquid mixture from the oil tank and separates the processed gas-liquid mixture into blowby gas and engine oil. The breather chamber then sends the blowby gas to the intake system and returns the engine oil to the crankcase.

Thus, since the gas-liquid mixture which is introduced to the breather chambers has already experienced gas-liquid separation to some extent in the oil tank, the possibility of the amount of gas-liquid mixture exceeding a capacity of separating gas from liquid in the breather chambers is reduced (or eliminated). As a result, since the gas-liquid separation is effectively performed in the breather chambers, engine oil can be prevented from running out to the intake system (e.g., see specification at page 7, lines 24-25, and page 8, lines 1-11).

Applicants' representative also pointed out that U.S. Patent No. 6,029,638 to Funai corresponds to JP 11-148333 to Funai, which was cited by Applicants in the Information

Disclosure Statement filed on July 7, 2003, and described by Applicants at pages 1-2 of the present application.

Applicants' representative explained that, in conventional devices such as the device disclosed by U.S. Patent No. 6,029,638 to Funai, the liquid and gas mixture in the crankcase is guided directly to the breather chamber.

Thus, in the conventional devices such as Funai, when an amount of the liquid and gas mixture exceeds a capacity of separating gas from liquid, the separation of gas from liquid cannot be effectively performed. As a result, the liquid and gas mixture blows out from the breather chamber and engine oil flows out to the intake system and an adverse effect is brought to an air cleaner and the like (e.g., see specification at page 1, lines 21-25, and page 2, lines 1-4).

Applicants' representative and the Examiner also discussed proposed claim amendments to define more clearly the features of the claimed invention, thereby overcoming the rejection under 35 U.S.C. § 112, second paragraph.

E. Results of the Interview:

The Examiner agreed that Funai does not disclose or suggest all of the features of the claimed invention. Thus, the rejections of claims 1-7 based on Funai should be overcome.

The Examiner indicated, however, that the prior art search will be updated.

The Examiner stated that, unless more relevant prior art is uncovered in the updated search, the present application should be in condition for allowance.

The Examiner also agreed that the proposed claim amendments should overcome the rejection under 35 U.S.C. § 112, second paragraph.

To ensure that Applicants have complied with the requirements for responding to each of the rejections set forth in the present Office Action, Applicants respectfully submit the following additional remarks.

II. THE CLAIMED INVENTION

The claimed invention is directed to a blowby gas circulation system for an engine including a crankcase and intake system, in which gas and liquid are effectively separated from a gas-liquid mixture generated in the crankcase and engine oil is prevented from flowing out to an intake system of the engine (e.g., see specification at page 2, lines 7-10).

In conventional devices, such as the device disclosed by U.S. Patent No. 6,029,638 to Funai (which corresponds to JP 11-148333 to Funai and was cited by Applicants in the Information Disclosure Statement filed on July 7, 2003, and also described at pages 1-2 of the present application), a greater part of the liquid and gas mixture in the crankcase is guided directly to the breather chamber.

Thus, in the conventional devices such as Funai, when an amount of the liquid and gas mixture exceeds a capacity of separating gas from liquid, the separation of gas from liquid cannot be effectively performed. As a result, the liquid and gas mixture blows out from the breather chamber and engine oil flows out to the intake system and an adverse

effect is brought to an air cleaner and the like (e.g., see specification at page 1, lines 21-25, and page 2, lines 1-4).

The claimed invention, on the other hand, provides a blowby gas circulation system in which all of the gas-liquid mixture G1 (all reference numerals herein being used for the Examiner's clarity only and not for limiting the claims) generated in the crankcase 5 is gathered in the upper space 23a of the oil tank 23. After the gas-liquid mixture G1 is subjected to the first gas-liquid separation, the gas-liquid mixture G2 is introduced to the breather chambers 30 and 32. That is, since the gas-liquid mixture G2 which has experienced the gas-liquid separation to some extent is introduced to the breather chambers 30 and 32, the possibility of the amount of gas-liquid mixture G2 exceeding a capacity of separating gas from liquid is reduced (or eliminated). As a result, since the gas-liquid separation is effectively performed in the breather chambers 30 and 32, engine oil can be prevented from running out to the intake system (e.g., see specification at page 7, lines 24-25, and page 8, lines 1-11).

Moreover, since the pumping power of the second oil pump 26 is established to a larger value than that of the first oil pump 21, the inside of the crankcase 5 is kept in a vacuum condition with respect to the first breather chamber 30, thereby the engine oil O1 and O2 separated in the breather chambers 30, 32 are smoothly sucked into the crankcase 5 (e.g., see specification at page 8, lines 12-17). Further, because the first and second breather chambers 30, 32 are integrally formed with the crankcase 5, the number of components of the blowby gas circulation system can be reduced (e.g., see specification at page 8, lines 18-21).

For example, in an illustrative, non-limiting aspect of the invention, as defined for example by independent claim 1, a blowby gas circulation system for an engine including a crankcase and an intake system. The blowby gas circulation system includes an oil tank for supplying engine oil reserved therein to the crankcase, for receiving a gas-liquid mixture generated in the crankcase, and for separating the gas-liquid mixture into a processed gas-liquid mixture and engine oil. The blowby circulation system further includes a breather chamber for receiving the processed gas-liquid mixture, for separating the processed gas-liquid mixture into blowby gas and engine oil, for sending the blowby gas to the intake system, and for returning the engine oil to the crankcase.

In another exemplary aspect of the invention, as defined for example by independent claim 2, a blowby gas circulation system for an engine including a crankcase and an intake system, includes an oil tank for supplying engine oil reserved therein to the crankcase, for receiving a first gas-liquid mixture generated in the crankcase, and for separating the first gas-liquid mixture into a second gas-liquid mixture and engine oil. The blowby gas circulation system further includes a first breather chamber for receiving the second gas-liquid mixture, for separating the second gas-liquid mixture into a third gas-liquid mixture and engine oil, and for returning the engine oil to the crankcase, and a second breather chamber for receiving the third gas-liquid mixture, for separating the third gas-liquid mixture into blowby gas and engine oil, for sending the blowby gas to the intake system, and for returning the engine oil to the crankcase.

In yet another exemplary aspect of the invention, as defined for example by independent claim 6, a method of circulating blowby gas for an engine including a crankcase, an intake system and an oil tank, including supplying engine oil reserved in the

oil tank to the crankcase, introducing a gas-liquid mixture generated in the crankcase to the oil tank, separating the gas-liquid mixture into a processed gas-liquid mixture and engine oil, introducing the processed gas-liquid mixture to a breather chamber, separating the processed gas-liquid mixture into blowby gas and engine oil in the breather chamber, and sending the blowby gas to the intake system and returning the engine oil which is separated from the processed gas-liquid mixture to the crankcase.

In another exemplary aspect of the invention, as defined for example by independent claim 7, a method of circulating blowby gas for an engine including a crankcase, an intake system and an oil tank, including supplying engine oil reserved in the oil tank to the crankcase, introducing a first gas-liquid mixture generated in the crankcase to the oil tank, separating the first gas-liquid mixture into a second gas-liquid mixture and engine oil, returning the engine oil which is separated from the first gas-liquid mixture to the crankcase, introducing the second gas-liquid mixture to a first breather chamber, separating the second gas-liquid mixture into a third gas-liquid mixture and engine oil in the first breather chamber, returning the engine oil which is separated from the second gas-liquid mixture to the crankcase, introducing the third gas-liquid mixture to a second breather chamber, separating the third gas-liquid mixture into blowby gas and engine oil in the second breather chamber, and sending the blowby gas to the intake system and returning the engine oil which is separated from the third gas-liquid mixture to the crankcase.

III. 35 U.S.C. § 112, SECOND PARAGRAPH, REJECTION

Claims 1-7 stand rejected under 35 U.S.C. § 112, second paragraph. Particularly, the Examiner alleges that the claims are generally narrative and indefinite because they appear to include grammatical errors (e.g., see Office Action at page 2, lines 2-9).

Applicants amend claims 1-3 and 5-7 to make minor editorial amendments to overcome this rejection, as agreed to in the personal interview.

Accordingly, the Examiner is requested to withdraw this rejection.

IV. THE PRIOR ART REJECTIONS

A. Claims 1, 2, 4, 6, and 7 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Funai.

As mentioned above, the Examiner agreed that Funai does not disclose or suggest all of the features of the claimed invention. Therefore, Applicants respectfully request that the Examiner withdraw this rejection.

As mentioned above, Applicants note that U.S. Patent No. 6,029,638 to Funai is related to JP 11-148333 to Funai, which was cited by Applicants in the Information Disclosure Statement filed on July 7, 2003, and described at pages 1-2 of the present application.

The present Office Action alleges that Funai discloses all of the features of the claimed invention. Particularly, the Office Action alleges that Figure 11 of Funai discloses an oil tank 59, a first breather chamber 18a, a second breather chamber 61h, a first pump 65, and a second pump 64 (e.g., see Office Action at page 2, fourth full paragraph). For the following reasons, Applicants respectfully traverse this rejection.

Applicants submit that Funai clearly does not disclose or suggest all of the features of the claimed invention, as defined for example by claims 1, 2, 4, 6, and 7.

For example, independent claim 1 recites a blowby gas circulation system for an engine including a crankcase and an intake system, comprising:

an oil tank for supplying engine oil reserved therein to said crankcase, for receiving a gas-liquid mixture generated in said crankcase, and for separating said gas-liquid mixture into a processed gas-liquid mixture and engine oil; and
a breather chamber for receiving said processed gas-liquid mixture, for separating said processed gas-liquid mixture into blowby gas and engine oil, for sending said blowby gas to said intake system, and for returning said engine oil to said crankcase (emphasis added).

As mentioned above, the claimed invention provides a blowby gas circulation system in which the gas-liquid mixture G1 generated in the crankcase 5 is gathered in the upper space 23a of the oil tank 23. After the gas-liquid mixture G1 is subjected to the first gas-liquid separation, the gas-liquid mixture G2 is introduced to the breather chambers 30 and 32.

Thus, since the gas-liquid mixture G2 which has experienced the gas-liquid separation to some extent is introduced to the breather chambers 30 and 32, the possibility of the amount of gas-liquid mixture G2 exceeding a capacity of separating gas from liquid is reduced (or eliminated). As a result, since the gas-liquid separation is effectively performed in the breather chambers 30 and 32, engine oil can be prevented from running out to the intake system (e.g., see specification at page 7, lines 24-25, and page 8, lines 1-11).

Moreover, since the pumping power of the second oil pump 26 is established to a larger value than that of the first oil pump 21, the inside of the crankcase 5 is kept in a

vacuum condition with respect to the first breather chamber 30, thereby the engine oil O1 and O2 separated in the breather chambers 30, 32 are smoothly sucked into the crankcase 5 (e.g., see specification at page 8, lines 12-17). Further, because the first and second breather chambers 30, 32 are integrally formed with the crankcase 5, the number of components of the blowby gas circulation system can be reduced (e.g., see specification at page 8, lines 18-21).

In comparison, Funai discloses guiding the liquid and gas mixture directly from the crankcase 11 to the first breather chamber 18a, as shown by Figure 11 of Funai. That is, Funai discloses a blowby gas circulation system for a drysump lubrication type engine in which a mixture of liquid (engine oil) and gas (e.g., blowby gas) generated in a crankcase is introduced directly to a breather chamber and the separation of gas from liquid is performed therein.

Indeed, Funai specifically describes “*first and second breather passages 28 and 29A, 29B extending between the valve chamber 18 and the crank chamber 19 to connect them in fluid communications with each other*” (e.g., see Funai at column 14, lines 38-41; emphasis added).

Moreover, Funai further discloses that “*mist and vapors of the lubricating oil are also generated in the crank chamber 19. The blowby gases, mist and vapors move through the first and second breather passages 28, 29A, 29B into the valve chamber 18*” (e.g., see Funai at column 15, lines 31-33; emphasis added).

Further, Funai specifically discloses that “*oil vapors generated in the lubricating oil tank 59 also flow into the valve chamber 18 through the first breather tube 73*” (e.g., see Funai at column 15, lines 33-36).

That is, in Funai, the oil tank is in direct communication with the breather (not the crankcase) via the first breather tube 73. On the other hand, only oil (i.e., not gas and liquid) is pumped by the second pump 64 through the intake passage 61e from the oil sump portion 11b to the oil tank 59 (e.g., see Figure 11 of Funai).

Thus, Funai clearly does not disclose or suggest “an oil tank... for receiving a gas-liquid mixture generated in said crankcase” as claimed in claim 1. Instead, in Funai, the first breather chamber 18a (not the oil tank) receives the gas-liquid mixture generated in the crankcase 11.

In the conventional devices such as Funai, when an amount of the liquid and gas mixture exceeds a capacity of separating gas from liquid, the separation of gas from liquid cannot be effectively performed. As a result, the liquid and gas mixture blows out from the breather chamber (e.g., breather chambers 18a and 61h) and engine oil flows out to the intake system (e.g., induction box 83 and carburetor 82). Accordingly, the device of Funai has an adverse effect on the air cleaner and the like (e.g., see specification at page 1, lines 21-25, and page 2, lines 1-4).

On the other hand, in the claimed invention, the greater part of the liquid and gas mixture in the crankcase is guided to the oil tank and then to the breather chamber. Therefore, even in cases where the amount of the liquid and gas mixture exceeds a capacity of separating gas from liquid, the separation of gas from liquid still can be effectively performed according to the novel and unobvious features of the claimed invention.

Thus, according to the claimed invention, the liquid and gas mixture is prevented from blowing out from the breather chamber and engine oil is prevented from flowing out to the intake system.

Applicants submit that independent claims 2, 6, and 7 also are patentable over Funai for somewhat similar reasons as those set forth above.

For example, independent claim 2 recites, *inter alia*, “an oil tank for supplying engine oil reserved therein to said crankcase, for receiving a first gas-liquid mixture generated in said crankcase, and for separating said first gas-liquid mixture into a second gas-liquid mixture and engine oil” (emphasis added).

Somewhat similarly, independent claim 6 recites, *inter alia*, a method of circulating blowby gas for an engine including a crankcase, an intake system and an oil tank, including:

supplying engine oil reserved in said oil tank to said crankcase;
introducing a gas-liquid mixture generated in said crankcase to said oil tank;
separating said gas-liquid mixture into a processed gas-liquid mixture and engine oil;
introducing said processed gas-liquid mixture to a breather chamber;
separating said processed gas-liquid mixture into blowby gas and engine oil in said breather chamber; and
sending said blowby gas to said intake system and returning said engine oil which is separated from said processed gas-liquid mixture to said crankcase (emphasis added).

On the other hand, independent claim 7 recites, *inter alia*, a method of circulating blowby gas for an engine including a crankcase, an intake system and an oil tank, including:

supplying engine oil reserved in said oil tank to said crankcase;
introducing a first gas-liquid mixture generated in said crankcase to said oil tank;
separating said first gas-liquid mixture into a second gas-liquid mixture and engine oil;
returning said engine oil which is separated from said first gas-liquid mixture to said crankcase;
introducing said second gas-liquid mixture to a first breather chamber;
separating said second gas-liquid mixture into a third gas-liquid mixture and engine oil in said first breather chamber;
returning said engine oil which is separated from said second gas-liquid mixture to said crankcase;
introducing said third gas-liquid mixture to a second breather chamber;
separating said third gas-liquid mixture into blowby gas and engine oil in said second breather chamber; and
sending said blowby gas to said intake system and returning said engine oil which is separated from said third gas-liquid mixture to said crankcase (emphasis added).

As set forth above, the Examiner agreed that Funai does not disclose or suggest all of the novel and unobvious features of the claimed invention, or for that matter, the novel and unobvious advantages derived therefrom.

Thus, claims 1, 2, 4, 6, and 7 clearly are not anticipated by, or rendered obvious from, Funai and the rejection of these claims should be withdrawn.

B. Claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over Funai. As mentioned above, the Examiner agreed that Funai does not disclose or suggest all of the features of the claimed invention.

The present Office Action alleges that Funai shows all of the features of the claimed invention except for the pumping capacity of the first and second pumps (i.e., pumps 65 and 64). However, the Office Action alleges that “[i]t would have been an

obvious matter of design choice to provide a second oil pump with a larger pumping power than the first pump, in order to provide a vacuum pressure in the crankcase, as it is conventionally necessary to provide a vacuum pressure in the crankcase in order for the engine to function properly and would have been well within the purview of one of ordinary skill in the art" (e.g., see Office Action at page 3, first paragraph).

Applicants submit that claim 5 is patentable over Funai based on its dependency from independent claim 2. Moreover, Applicants submit that claim 5 is patentable over Funai based on the additional features recited therein.

For example, claim 5 recites, *inter alia*, that “a pumping power of said second oil pump is larger than a pumping power of said first oil pump such as to produce a vacuum pressure in said crankcase.”

As mentioned above, the Office Action alleges that this feature would have been an obvious design choice and that such is “conventionally” known in the art.

As mentioned above, the Examiner agreed that Funai does not disclose or suggest all of the features of the claimed invention. However, to preserve Applicants' rights, and should the Examiner maintain this rejection, Applicants respectfully request that the Examiner cite a reference in support of her position (e.g., see M.P.E.P. § 2144.03).

For the foregoing reasons, Applicants submit that claim 5 also is patentable over Funai and the rejection of claim 5 should be withdrawn.

V. NEW CLAIMS

New claims 8-30 are added to provide more varied protection for the present invention as described in the original specification and drawings.

Applicants respectfully submit that new claims 8-20 are patentable over the cited references for somewhat similar reasons as those set forth above, as well as for the additional recitations recited therein.

Accordingly, the Examiner respectfully is requested to permit claims 8-20 to pass to immediate allowance.

VI. FORMAL MATTERS AND CONCLUSION

Applicants note that minor typographical and spelling errors have been corrected in the specification and Abstract.

Applicants also respectfully request that the Examiner accept and approve the Formal Drawings filed on July 7, 2003.

In view of the foregoing, Applicant submits that claims 1-30, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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John J. Dresch, Esq.
Registration No. 46,672

Sean M. McGinn
Registration No. 34,386

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254